

## New Claims

28. (New) A qubit, comprising:  
a first bank of a superconducting material having a first crystal orientation;  
a mesoscopic island having a second crystal orientation formed adjacent to the first bank; and  
a clean Josephson junction formed between the first bank and the mesoscopic island, wherein the first crystal orientation and the second crystal orientation are different.
29. (New) The qubit of Claim 28, wherein at least one of the first bank and the mesoscopic island is formed of a d-wave superconducting material.
30. (New) The qubit of Claim 28, further including a grounding mechanism coupled between the mesoscopic island and a ground.
31. (New) The qubit of Claim 30, wherein the grounding mechanism is a single electron transistor.
32. (New) The qubit of Claim 30, wherein the grounding mechanism is a parity key.
33. (New) The qubit of Claim 28, wherein the clean Josephson junction includes a grain boundary between the island and the first bank.
34. (New) The qubit of Claim 28, wherein the clean Josephson junction includes a normal metal.
35. (New) The qubit of Claim 28, further comprising:  
a second bank of superconducting material having a third crystal orientation; and  
a Josephson junction formed between the first bank and the second bank.
36. (New) The qubit of Claim 35, further comprising:  
a coupling mechanism coupled between the mesoscopic island and the second bank.
37. (New) The qubit of Claim 36, wherein the coupling mechanism includes a single electron transistor.
38. (New) The qubit of Claim 36, wherein the coupling mechanism includes a parity key.
39. (New) A quantum register, comprising:  
a first bank of superconducting material;  
at least one mesoscopic island of a superconducting material;  
Josephson junctions formed between each of the at least one mesoscopic island and the bank.
40. (New) The quantum register of Claim 39, wherein the bank includes a d-wave superconductor.
41. (New) The quantum register of Claim 39, wherein at least one of the mesoscopic islands includes a d-wave superconductor.

LAW OFFICES OF  
SKJERVEN MORRILL  
MACPHERSON LLP

25 METRO DRIVE  
SUITE 700  
SAN JOSE, CA 95110  
(408) 453-9200  
FAX (408) 453-7979

42. (New) The quantum register of Claim 39, further including at least one first coupling mechanism, each of the at least one first coupling mechanisms coupling a corresponding one of the at least one mesoscopic islands to ground.
43. (New) The quantum register of Claim 42, wherein at least one of the first coupling mechanisms includes a single electron transistor.
44. (New) The quantum register of Claim 42, wherein at least one of the first coupling mechanisms includes a parity key.
45. (New) The quantum register of Claim 39, wherein at least one pair of mesoscopic islands are coupled by a second coupling mechanism.
46. (New) The quantum register of Claim 45, wherein the second coupling mechanism includes a single electron transistor.
47. (New) The quantum register of Claim 45, wherein the second coupling mechanism includes a parity key.
48. (New) The quantum register of Claim 39, further including:  
a second bank of superconducting material; and  
a Josephson junction formed between the second bank and the first bank.
49. (New) The quantum register of Claim 48, further including at least one third coupling mechanism coupled between one of the mesoscopic islands and the second bank.
50. (New) The quantum register of Claim 49, wherein the third coupling mechanism includes a single electron transistor.
51. (New) The quantum register of Claim 49, wherein the third coupling mechanism includes a parity key.

LAW OFFICES OF  
SKJERVEN MORRILL  
MACPHERSON LLP

25 METRO DRIVE  
SUITE 700  
SAN JOSE, CA 95110  
(408) 453-9200  
FAX (408) 453-7979